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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,717	01/26/2004	Shaz Qadeer	3382-66931	2565

26119 7590 02/06/2007	EXAMINER
KLARQUIST SPARKMAN LLP 121 S.W. SALMON STREET SUITE 1600 PORTLAND, OR 97204	DENG, ANNA CHEN

ART UNIT	PAPER NUMBER
2191	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/06/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

PTOL-90A (Rev. 10/06)

	Application No.	Applicant(s)
Office Action Summary	10/765,717	QADEER ET AL.
	Examiner	Art Unit	.
	Anna Deng	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>26 January 2004</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-20</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-20</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>26 January 2004</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>12/21/2005</u>.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1.   This action is in responses to application filed on 1/26/2004.

2.   The preliminary amendment filed on 5/17/2004.

3.   The Specification has been amended.

4.   Claim 18 has been amended.

5.   Claims 1-20 are pending and have been examined.

Claim Rejections - 35 USC § 101

6.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
> matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
> conditions and requirements of this title.

7.   Claims 1-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-

statutory subject matter as being functional descriptive material.

Claims 1-12 set forth "a system for detecting a data race in a concurrent program comprising a

program sequential module" that is computer programs claimed as computer listings per se, i.e., the

descriptions or expressions of the programs, are not physical "things." They are neither computer

components nor statutory processes, as they are not "acts" being performed. Such claimed computer

programs do not define any structural and functional interrelationships between the computer program

and other claimed elements of a computer which permit the computer program's functionality to be

realized. In contrast, a claimed computer-readable medium encoded with a computer program is a

computer element which defines structural and functional interrelationships between the computer

program and the rest of the computer which permit the computer program's functionality to be realized,

and is thus statutory. See Lowry, 32 F. 3d at 1583-84, 32 USPQ2d at 1035 (see 1300 OG 142142

(November 22, 2005) (in particular, see Annex IV (a)).

8.   Claims 13-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-

statutory subject matter. Claim 13 set forth a method of analyzing a concurrent program for data races,

the method creating a sequential program, recite "such that if the assertions are not met, the presence of

a data race...is indicated." that is an alternate condition and result. Claim 18 is similar to claim 13, except

that it set forth a computer-readable medium containing instructions. In determining whether the claim is

for a "practical application," the focus is not on whether the steps taken to achieve a particular result are

useful, tangible and concrete, but rather that the <u>final result</u> is "useful, tangible and concrete." The

Federal Circuit further ruled that it is of little relevance whether a claim is directed to a machine or process

for the purpose of a § 101 analysis. *AT&T Corp. v. Excel Commc'ns,* 172 F. 3d 1352, 1358, 50 USPQ2d

1447, 1451 (Fed. Cir. 1999).

As achieving the non-concrete results, claims 13-20 are not limited to a practical application, the

claims are non-statutory.

9.   Claims 18-20 set forth a computer-readable medium containing instructions. Applicant's

Specification defines "The communication medium conveys information such as computer-executable

instructions, audio/video or other media information, or other data in a modulated data signal..."

(Specification, page 20, lines 18-24), reasonably interpreted to include signals encode with functional

descriptive material. The Office's current position is that claims involving signals encoded with functional

descriptive material do not fall within any of the categories of patentable subject matter set forth in 35

U.S.C. 101, and such claims are therefore ineligible for patent protection. *See* 1300 OG 142 (November

22, 2005) (in particular, see Annex IV (c)).

Claim Rejections - 35 USC § 112

10.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

11.   Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for

omitting essential elements/steps, such omission amounting to a gap between the steps. See MPEP

§ 2172.01. In independent claim 1, the omitted elements/steps are: how the assertions cause an error

message to be produced. In independent claim 13, the omitted steps are: how the presence of a data

race in the concurrent program for the target variable is indicated. In independent claim 18, the omitted

elements/steps are: how the presence of an error in the concurrent program is indicated. Claims 2-12,

14-17, and 19-20 are rejected because they depend on claims 1, 13, or 18.

12.   Claims 5, 13, and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for

failing to particularly point out and distinctly claim the subject matter which applicant regards as the

invention.

In claims 13 and 18, lines 6 recite, "such that if the assertions are not met, the presence of a data

race...is indicated". The claims have the alternative condition and results that cause the claims are being

indefinite.

In claim 5, lines 5, recites "the analyzed variable", there is insufficient antecedent basis for this

limitation in the claim. In the interest of compact prosecution, this limitation is subsequently interpreted as

--the target variable--.

At the end of claim 5, recites "the variable", as the claim contains a "target variable" and a "global

access variable", it is not clear the limitation refers to which variable. The limitation is ambiguity. As best

understood by examiner, "the variable" refers to "target variable".

Claim Rejections - 35 USC § 102

13.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for

the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public
use or on sale in this country, more than one year prior to the date of application for patent in the United
States.

14.   Claims 1-20 are rejected under 35 U.S.C. 102 (b) as being anticipated by Charistiaens, US

2002/0120428·A1 (hereinafter Christiaens).

Per Claim 1:

Christiaens discloses:

- A system for detecting a data race in a concurrent program (paragraph 0018, lines 1-6), the system comprising:

- a program sequentializer module configured to accept a concurrent program as input (Figs. 17a-17b, paragraph 0246-0247, 0255-0261, the sequentializer module consists of elements in 17a or 17b), and create as output a sequential program having assertions (paragraph 0255, "the actual race detection is carried. For this, 20 bytecodes, for instance, are instrumented which read or write to an object. Each time such a byte code is executed, it is checked whether it is a global object...If a global object is being dealt with, the extra data structures can be accessed and it can be verified, ...whether this <u>instruction represents a data race. If so, this is flagged to the user</u> (emphasis added)");

- wherein the assertions cause an error message to be produced when the concurrent program contains a data race (Fig. 1, 111 and 109, paragraph 0102, lines 23-27, paragraph 0106).

Per Claim 2:

Christiaens discloses:

- The system of claim 1, further comprising a sequential program analyzer module which analyzes the sequential program and produces error messages if assertions are not met and wherein the assertions are created to be checked by the sequential program analyzer ("a report of potential data races", paragraph 0025).

Per Claim 3:

Christiaens discloses:

- The system of claim 1, wherein the sequential program utilizes a single runtime stack (Fig. 13, stack 1501, paragraph 0192) and the program sequentializer module is further configured

to add data structures (Fig. 4, instrumentation 404, a thread information structure 410, paragraphs 0169-0172) to the received code, the added data structures at least comprising:

- a multiset of thread pointers which comprises pointers to threads which have been created but have not yet been scheduled on the runtime stack (Fig. 4, pointers 405-406, 408, paragraphs 0114-0115, and 0117); and

- a global boolean exception variable which, when set, causes the sequential program to remove from the runtime stack the currently-executing thread (Figs. 4-5 and 13, TID field, paragraphs 0116, and 0183-0189).

Per Claim 4:

Christiaens discloses:

- The system of claim 3, wherein: the multiset of thread pointers is limited to a maximum number of pointers; and the added data structures further comprise a global multiset size variable, which indicates the maximum number of pointers (the length of the translation table 611, Fig. 6, paragraphs 0136-137) .

Per Claim 5:

Christiaes discloses:

- The system of claim 3, wherein: the program sequentializer module is further configured to receive an indication of a target variable which will be analyzed for data races (Fig. 13, global set 1508, paragraphs 0019, 0183); and

- the added data structures further comprise a global access variable which indicates, for the analyzed variable, the current type of access being requested of the variable (paragraphs 0036, and 0038).

Per Claim 6:

Christiaens discloses:

- The system of claim 5, wherein the program sequentializer module is further configured to insert instrumentation into the received code (Fig. 4, instrumentation 404, thread information structure 410), the instrumentation at least comprising:

- a scheduling function which selects a thread pointer from the multiset and schedules the thread indicated by the pointer on the runtime stack (synchronization operation, paragraph 0171);

- an exception macro which sets the global boolean exception variable and causes an executing thread to be removed from the runtime stack (S_{tot}, paragraph 0194-0195);

- a read-checking function, which checks to see that the global access variable does not indicate that the target variable is being written to and then sets the global access variable to indicate that the target variable is being read from (Fig. 14, 1609, 1010, 'read information structure', paragraph 0205); and

- a write-checking function, which checks to see that the global access variable does not indicate that the target variable is being read from or written to and then sets the global access variable to indicate that the target variable is being written to (Fig. 14, 1610,1618, 'write information structure' paragraph 0206).

Per Claim 7:

Christiaens discloses:

- The system of claim 6, wherein the read-checking and write-checking functions contain assertions about the global access variable which can be checked by the sequential program analyzer module (Fig. 14, 1611 and 1618, paragraphs 0207-0218).

Per Claim 8:

Christiaens discloses:

- The system of claim 6, wherein the instrumentation is inserted so that it will execute nondeterministically in the sequential program (Fig. 4, instrumentation 404, paragraphs 0170-174).

Per Claim 9:

Christiaens discloses:

- The system of claim 1, wherein the sequential program output by the sequentializer module is in the form of source code (sequential execution order of code, paragraphs 1056, 0162).

Per Claim 10:

Christiaens discloses:

- The system of claim 1, wherein the sequential program output by the sequentializer module is in the form of an abstract syntax tree or a control-flow graph (Fig. 7, sequential execution order of events in one thread, T_1, paragraph 0162).

Per Claim 11:

Christiaens discloses:

- The system of claim 1, wherein the concurrent program received by the sequential analyzer is in the form of source code (Figs 8-10, T_1 and T_2, paragraphs 0163-0166).

Per Claim 12:

Christiaens discloses:

- The system of claim 1, wherein the concurrent program received by the sequential analyzer

   is in the form of an abstract syntax tree or control-flow graph (Figs. 8-10, and 13, paragraphs

   0174-0175).

Per Claims 13-17:

These are method version of the claimed system discussed above (claims 1-8), wherein all

claimed limitations also have been addressed and/or covered in cited areas as set forth above. Thus

accordingly, these claims are also anticipated by Christiaens.

Per Claims 18-20:

These are computer-readable medium version of the claimed method discussed above (claims

13-15), wherein all claimed limitations also have been addressed and/or covered in cited areas as set

forth above. Thus accordingly, these claims are also anticipated by Christiaens.

Conclusion

15.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should

be directed to Anna Deng whose telephone number is 571-272-5989. The examiner can normally be

reached on Monday to Friday 9:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei

Zhen can be reached at 571 –272-3708. The fax phone number for the organization where this

application or proceeding is assigned is 703-273-8300.

Information regarding the status of an application may be obtained from the Patent Application

Information Retrieval (PAIR) system. Status information for published applications may be obtained from

either Private PAIR or Public PAIR. Status information for unpublished applications is available through

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC)

at 866-217-9197 (toll-free).

Anna Deng   *a̲.A̲*

January 24, 2007